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METHOD OF CLEANING METAL ARTICLES

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1 Claim. (Cl. 148—8)

This invention has reference to a method of cleaning metallic articles which are to be coated with a protective coating of zinc.

The invention is especially adapted to iron or steel articles such as wire, although it may be found readily adaptable to other ferrous articles, as for example iron or steel sheets, strips and similar articles.

The invention has for its principal object to improve the zinc coating of iron or steel articles, as for example wire, sheets, strips and the like, made from rimmed or open steel.

The invention has for a further object, the cleaning and preparing the surface of the metallic articles, before galvanizing, by subjecting the article to a molten bath of a mixture of sodium carbonate and potassium carbonate, which is a preferred method; or the article may be subjected to a water paste, made up of either sodium carbonate or potassium carbonate or a mixture of the two, and subsequently anneal the article to the preferred physical properties, and then coat the article with a protective coating of zinc. Employing a molten bath of salts consisting of a mixture of sodium carbonate and potassium carbonate I am enabled to anneal the article and at the same time the bath will act upon the surface of the article so as to clean and etch such surfaces and prepare said surface to take a more adherent heavy coating of zinc. In the use of the saturated water solution the article is first treated with the solution and then subsequently annealed and galvanized.

In practicing the invention, I prefer to treat the article so as to clean and prepare its surface for the application of the zinc coating, by subjecting the same to the combined salts, sodium carbonate and potassium carbonate, in a molten state. Such a bath is convenient and expedient and by its use it is possible to anneal the metallic article to the desired physical strength and obtain the cleaning and preparation of the surface of the article, at the same time. The same beneficial results, however, may be obtained by subjecting the article to a water paste made up of either sodium carbonate or potassium carbonate or a mixture of the two, and subsequently anneal the article to the preferred physical properties. Of the water solutions, which may be used, I prefer the solution of sodium carbonate alone, as the cost is less, and I prefer to keep the solution at or near a boiling temperature since it aids materially in drying the article before subsequent annealing. The solution may also be kept at room temperature.

I have discovered in the use of the molten bath of a mixture of the sodium carbonate and potassium carbonate that the bath has no carburizing effect on the article and as far as I have been able to find, has no effect except that it is slightly oxidizing. Experience in the use of the invention leads me to believe that the sodium oxide which is formed by the decomposition of the salt has a tendency to etch the iron or steel around the grain boundaries and I have found that the bath of the invention gives a cleaner surface on the article than is obtained by any ordinary treatment.

The temperature of the molten bath may range from 1250° to 1400° F. I have obtained the most satisfactory results employing a temperature between 1325° and 1350° F.

Sodium carbonate or potassium carbonate may be used alone in the molten condition and correspondingly similar results obtained, but temperatures ranging from 1550° to 1750° F. must be used. However, if such high temperatures are used, a very soft wire is produced. The temperature range at which the molten salt could be operated would, of course, depend on the physical properties desired in the article. In the treating and coating of iron or steel wire, I have obtained the best tensile strength and other physical properties when the combination with salts is used at the specified temperature of 1325° to 1350° F.

I wish to point out, that there is no carburizing or nitriding effect obtained by the use of sodium carbonate or potassium carbonate alone, or in combination. When these salts are heated they decompose as is illustrated by the following formula: Na_2CO_3 give $Na_2O—CO_2$. As can be seen this decomposition will give an oxidizing bath which is exactly the opposite of carburizing.

I am aware that efforts have been made to anneal iron or steel articles in certain molten salts, or for annealing the same in such molten salts prior to galvanizing, but because of the characteristics of the bath of this invention, I am of the opinion that the same is not anticipated by any such disclosure.

To practice the invention in the first instance, where a molten bath of a mixture of sodium carbonate and potassium carbonate is employed, the article to be treated and coated with zinc would be first subjected to such a bath which would both treat the surface of the article and anneal the same. Assuming the article to be an iron or steel wire, it would pass from the bath through an acid tank and be finally coated with a protective coating of zinc. By the method de-

scribed for cleaning and preparing the surface of the article, the surface is made more susceptible to the attack by the zinc and thus alloys better, giving a firmer bond. In the second instance, that is employing a saturated solution of the salts, the article, assuming it to be an iron or steel wire, would be subjected to the solution, then annealed in a suitable furnace, then passed through the acid tank and finally coated with a protective coating of zinc.

The invention, as I have heretofore pointed out, is particularly adapted for the galvanizing of rimmed or open steel and the invention may be successfully employed with either a molten mixture of sodium carbonate and potassium carbonate or each of these compounds used alone. Furthermore, iron or steel articles may be successfully treated and galvanized by the use of the water solution of a mixture of these salts, or each alone, and the article subsequently annealed, to obtain the necessary physical properties.

It is obvious that those skilled in the art may vary the details of the procedure without departing from the spirit of the invention, and therefore it is not desired to be limited to the above disclosure except as may be required by the claim.

What I claim is:

The process of treating the surface of a body of rimmed or open steel prior to the application of a zinc coating thereon, which consists in chemically roughening the surface of the body by immersing the same in a molten bath of an alkaline carbonate for a sufficient time to effect an opening of the exposed grain boundaries, and then subjecting the treated body to a pickling operation to cleanse the roughened surface.

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